# Improving Response Rates through Incentive and Follow-Up: The Effect on a Survey of Physicians' Knowledge of Genetics


## ABSTRACT

*Objectives.* This study assessed efforts to increase response rates to a mailed physician survey and examined whether, as a result, nonresponse bias was reduced.

*Methods.* Randomly selected physicians and geneticists were mailed a questionnaire concerning genetics knowledge and attitudes. In the final but not the pilot survey, a $25 incentive and intensive follow-up were used to increase the response rate.

*Results.* The response rate from physicians in the final survey was 64.8% (n = 1140), compared with 19.6% in the pilot test (n = 69). Sample representativeness in sociodemographic and practice characteristics was improved by follow-up. Respondents recruited with more difficulty did not differ on the principal outcome variable, genetics knowledge, except on one subscore. Pilot study and final survey respondents did not differ in knowledge.

*Conclusions.* Although the effect of increased response rates on the principal outcome variable in this study was minimal, this may not be the case for other studies. Every effort should be made to attain as high a response rate as is practical and to establish that respondents are representative of the population being sampled. (*Am J Public Health.* 1993;83:1599–1603)



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## Introduction

Findings from surveys in which response rates are low are open to the criticism that they do not represent the entire population sampled. Increasing response rates may not, however, reduce nonresponse bias if the additional respondents resemble those easily recruited more than they resemble the remaining nonrespondents.[1–3] Differences between respondents and nonrespondents can still be found with moderately high (60% to 70%) response rates.[1,4] Others have concluded that with response rates of 75%, the bias introduced by differences between respondents and nonrespondents may be minimal.[5]

We obtained very low response rates in pilot testing a survey of physicians' knowledge and attitudes regarding human genetics. Consequently, extensive measures were taken to increase the response to the final survey, and a much higher response rate was achieved. This paper describes the steps taken to increase responses and examines whether the increase minimized response bias and affected the outcome variables of interest. Three questions were investigated: (1) Were there significant differences between respondents and nonrespondents to the final survey in sociodemographic and practice characteristics? (2) Did follow-up measures that brought in additional respondents improve sample representativeness and therefore alter the primary outcome variables? and (3) Did respondents to the final survey differ from pilot test respondents in their responses to the outcome variables? The answers to these questions have implications for choosing a cost-effective approach to surveying physicians. If respondents recruited with greater difficulty resemble other respondents more than they resemble nonrespondents and do not, therefore, reduce response bias, incentives and follow-up aimed solely at increasing response rates may not be effective.

## Methods

### Pilot Test

A questionnaire was developed by our team of geneticists and behavioral scientists. Revisions were made after each of two pretests, the first involving two local genetic counselors and four medical geneticists and the second involving a panel of 10 local primary care physicians.

The resulting questionnaire was pilot tested on a national sample consisting of 72 each of family physicians, internists, obstetrician-gynecologists, pediatricians, and psychiatrists. (From this point on, "physicians" refers to the above specialties but not to geneticists.) Physicians were randomly selected from the American Medical Association Physician Masterfile. Because we were more interested in determining what is currently being taught in medical schools, physicians in each specialty who graduated from medical school between 1971 and 1985 were sampled in a ratio of 2:1 relative to those who graduated between 1950 and 1970. A


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sample of 72 board-certified geneticists and genetic counselors was randomly selected from lists provided by the American Board of Medical Genetics.

The questionnaire was mailed to physicians accompanied by a letter from the principal investigator and a letter of support from the American Medical Association. In addition, letters of support were enclosed from the American Academy of Family Physicians, the American College of Physicians, the American Society of Internal Medicine, the Society of Perinatal Obstetricians, and the American Academy of Pediatrics in the mailing to physicians in the corresponding specialty. The geneticists' questionnaires were accompanied only by a letter from the principal investigator. Subjects were assured that after data collection was complete, their responses would be anonymous. A postcard reminder was mailed to all nonrespondents 2.5 weeks after the questionnaire mailing. The data collection process lasted approximately 2 months.

In order to assess the usefulness of offering 10 American Medical Association category 1 continuing medical education credits in the final survey as a response incentive, a random sample of half of the physicians in each specialty in the pilot sample were offered such credits for completing the questionnaire.

### *Final Survey*

*Questionnaire.* The questionnaire was revised on the basis of an analysis of the pilot survey. The final version of the questionnaire could be completed by physicians in approximately 30 minutes. All questions, except for certain demographic questions, were in multiple choice format. Demographic, genetics knowledge, and opinion questions, as well as two psychometric scales, were included. It was the consensus of the developers that respondents who answered the knowledge questions correctly would be capable of explaining test results to their patients. A detailed description of the knowledge questions appears elsewhere,[6] and other analyses are in preparation.

*Sample.* The physician sample for the final survey was also selected from the American Medical Association Physician Masterfile. Physicians in only 10 states were sampled to make it easier to gain the help of local chapter chairs of medical specialty societies in improving response rates. One state was randomly selected from each of the 10 genetics network regions established by the Health Resources Administration of the US Department of Health and Human Services. The 10 states were New York, Illinois, Nebraska, Pennsylvania, Utah, Maine, Oregon, California, South Carolina, and Texas. Sampling in New York and California was limited (by random selection) to upstate areas and greater Los Angeles, respectively, in order to include only one chapter area per state for each specialty society. Physicians in each specialty were sampled in equal numbers from each state. In each state, physicians within each specialty who graduated between 1971 and 1985 were sampled in a ratio of 2:1 relative to those who graduated between 1950 and 1970. Participation was invited only from members or candidate members of the following societies (as determined by a search of the societies' directories): American Academy of Family Physicians, American College of Physicians, American College of Obstetricians and Gynecologists, American Academy of Pediatrics, and American Psychiatric Association. The final sample included 1795 physicians. (358 family physicians, 360 internists, 360 obstetrician-gynecologists, 359 pediatricians, and 358 psychiatrists). For comparison, 180 medical geneticists and 180 genetic counselors in the same 10 states were sampled from membership lists provided by the American Board of Medical Genetics. For states with 18 or fewer medical geneticists or genetic counselors, all names were selected. For the remaining states, 18 medical geneticists and 18 genetic counselors were randomly selected. For each state with fewer than 18, one geneticist was selected from each of the states with a surplus until 18 had been sampled.

*Response incentives.* Two incentives were offered to all physicians. First, respondents were offered a check for $25 on return of the completed questionnaire. Second, except for family physicians, respondents were offered 10 American Medical Association category 1 continuing medical education credits for completing the questionnaire and agreeing to review additional information sent afterward. The American Academy of Family Physicians agreed to award 7 prescribed continuing medical education credits to family physicians for the same activities. The prescribed credits are valuable to family physicians in terms of recertification.

*Administration and follow-up.* A number of additional measures were taken to achieve response rates for physicians higher than those obtained in the pilot test. Chapter chairs of the American Academy of Family Physicians, the American Academy of Pediatrics, and the American Psychiatric Association co-signed, with the principal investigator, the letter that accompanied the questionnaire to physicians in their chapters and also signed a postcard reminder. In some instances, the chapter chair included a personal note with the letter. The American College of Physicians agreed to have its president cosign the letters to internists. Consistent with its policy of limiting access to its membership for survey purposes, the American College of Obstetricians and Gynecologists declined to participate. Consequently, the president of the Society of Perinatal Obstetricians agreed to cosign all cover letters to obstetricians. As in the pilot study, subjects were assured that their responses would remain anonymous.

An "alert" postcard preceded the questionnaire mailing to physicians by 3 working days. Follow-up included a postcard reminder, phone calls from a survey research firm 2 weeks after the initial mailing, a second questionnaire mailing to physicians in specialties with response rates lower than 55% (family physicians, internists, and obstetricians), and a final round of phone calls to these physicians. Because no difficulty was anticipated in obtaining an adequate response from medical geneticists and genetic counselors, incentives were not offered to these subjects, and follow-up was limited to a postcard reminder. The entire data collection process lasted approximately 4.5 months.

## *Results*

### *Response Rates*

Questionnaires that for some reason did not reach the intended respondent (i.e., death, retirement, relocation) were not included in calculations of response rates. The average response rate for the pilot test from physicians was 19.6%. The highest response was from pediatricians, and the lowest rate was from obstetricians. A much higher response (74.6%) was obtained from geneticists (Table 1). With the exception of family physicians, the offer of continuing medical education credits did not affect the likelihood of response.

Physician response rates in the final survey were significantly higher than those in the pilot test (Table 1). The overall response rate for physicians was 64.8%. Again, the response from pediatricians was greater than from other specialties,

and a high response rate (79.1%) was achieved for geneticists.

### *Respondents vs Nonrespondents: Final Survey*

Information included on the American Medical Association Physician Masterfile was used to compare physician respondents and nonrespondents in the final survey by chi-square analysis. Six of eight demographic and practice variables differed significantly at $P < .05$ (Table 2). Respondents were more likely than nonrespondents to be younger than 40, to have graduated from US medical schools, to have graduated from medical school after 1977, and to be board certified; they were less likely to be in practice by themselves. Pediatricians were more likely to respond than physicians in other specialties. For variables that showed a significant difference overall between respondents and nonrespondents, the trend remained the same when analyzed by specialty, although the level of significance varied.

A logistic regression with respondent vs nonrespondent as the dependent variable was performed to adjust for confounding among the practice variables. Attending a US rather than foreign medical school was the most important predictor, with US medical school graduates being more than twice as likely to respond as foreign medical graduates (OR = 2.158, $P < .0001$). Year of graduation, specialty, and board certification were independently related to the likelihood of response. Other variables were not significant.

### *Effect of Additional Respondents on Sample Representativeness*

Of the physicians, 23.5% responded within 3 working days of the postcard reminder mailing ("early" group) and 18.8% responded within 5 days of the first telephone follow-up ("middle" group). An additional 22.5% responded before termination of data collection ("late" group).

Comparisons by length of time taken to return the questionnaire are presented in Table 3. Significant differences between early, middle, and late respondents were found for several demographic and practice variables. A stepwise multiple regression with number of days to respond as the dependent variable was performed to adjust for confounding among the variables associated with response time. Specialty, US medical school, race, and importance of attending religious services accounted for 6% of the variance in response time.

**TABLE 1—Response Rates by Specialty: Pilot Test vs Final Survey**

| Specialty | Pilot Test | | | Final Survey | | |
|---|---|---|---|---|---|---|
| | No. in Sample | No. Responding | Response Rate, % | No. in Sample | No. Responding | Response Rate, % |
| Family physician | 71 | 13 | 18.3 | 347 | 215 | 62.0* |
| Internist | 72 | 14 | 19.4 | 351 | 214 | 61.0* |
| Obstetrician/gynecologist | 72 | 9 | 12.5 | 356 | 224 | 62.9* |
| Pediatrician | 70 | 19 | 27.1 | 354 | 257 | 72.6* |
| Psychiatrist | 67 | 14 | 20.9 | 351 | 230 | 65.5* |
| Total | 352 | 69 | 19.6 | 1759 | 1140 | 64.8* |
| Medical geneticist | 32 | 23 | 71.9 | 178 | 141 | 79.2 |
| PhD geneticist | 7 | 6 | 85.7 | ... | ... | ... |
| Genetic counselor | 32 | 24 | 75.0 | 176 | 139 | 79.0 |
| Total | 71 | 53 | 74.6 | 354 | 280 | 79.1 |

*$P < .0001$ (chi-square test, pilot vs final response rate).

**TABLE 2—Comparison of Respondents and Nonrespondents on Demographic and Practice Variables**

| | Respondents (n = 1140), % | Nonrespondents (n = 619), % | P[a] |
|---|---|---|---|
| Sex | | | |
| Male | 80.5 | 81.9 | .48 |
| Female | 19.5 | 18.1 | |
| Year of birth | | | |
| <1945 | 34.4 | 38.4 | |
| 1945–1951 | 33.8 | 38.0 | .001 |
| >1951 | 31.8 | 23.6 | |
| US medical school graduate | 86.7 | 77.2 | <.00001 |
| Year of graduation from medical school | | | |
| 1950–1970 | 32.4 | 34.6 | |
| 1971–1977 | 31.2 | 37.3 | .001 |
| 1978–1985 | 36.4 | 28.1 | |
| Specialty | | | |
| Family physician | 18.9 | 21.3 | |
| Internist | 18.8 | 22.1 | |
| Obstetrician/gynecologist | 19.6 | 21.3 | .008 |
| Pediatrician | 22.5 | 15.7 | |
| Psychiatrist | 20.2 | 19.5 | |
| Board certified | 90.1 | 84.3 | .0005 |
| Major professional activity | | | |
| Office | 77.4 | 81.4 | |
| Hospital staff (including residents and fellows) | 13.3 | 10.5 | .10 |
| Research | 3.9 | 2.4 | |
| Other | 5.4 | 5.7 | |
| Present employment | | | |
| Solo/2-physician practice | 37.4 | 43.9 | |
| Group practice | 30.1 | 27.6 | .03 |
| Other | 32.5 | 28.4 | |

[a]By chi-square test.

Academic appointments did not enter the regression equation.

No differences were found between early, middle, and late respondents on questions related to genetics training and experience and attitudes toward genetics. An overall genetics knowledge score was created by assigning one point for each correct answer (one 4-part question was assigned one-fourth point for each correct answer), for a possible total score of 26. Concepts (maximum score = 17) and facts (maximum score = 9) subscores were also computed.[6] The overall score

**TABLE 3—Comparison of Early, Middle, and Late Respondents on Demographic and Practice Variables**

| | Initial Sample[a] (n = 1759), % | Respondent Group: Early (n = 414), % | Middle (n = 331), % | Late (n = 395), % | P[b] |
|---|---|---|---|---|---|
| Sex | | | | | |
| Male | 81.0 | 80.7 | 80.1 | 80.8 | .97 |
| Female | 19.0 | 19.3 | 19.9 | 19.2 | |
| Year of birth | | | | | |
| <1945 | 35.8 | 34.8 | 31.7 | 36.2 | |
| 1945–1951 | 35.2 | 31.9 | 35.3 | 34.4 | .56 |
| >1951 | 28.9 | 33.3 | 32.9 | 29.4 | |
| Race/ethnic group | | | | | |
| White | | 93.2 | 87.9 | 85.5 | |
| Black | | 0.7 | 2.1 | 1.5 | |
| Hispanic | | 0.5 | 1.5 | 3.1 | .008 |
| Asian | | 4.9 | 8.2 | 9.7 | |
| Other | | 0.7 | 0.3 | 0.3 | |
| US medical school graduate | 83.3 | 90.6 | 86.1 | 83.0 | .006 |
| Year of graduation from medical school | | | | | |
| 1950–1970 | 33.1 | 32.4 | 32.6 | 32.2 | |
| 1971–1977 | 33.4 | 30.9 | 31.1 | 31.6 | .999 |
| 1978–1985 | 33.5 | 36.7 | 36.3 | 36.2 | |
| Specialty | | | | | |
| Family physician | 19.7 | 17.1 | 18.4 | 21.0 | |
| Internist | 20.0 | 19.8 | 11.5 | 23.8 | |
| Obstetrician/gynecologist | 20.2 | 21.0 | 14.8 | 22.3 | <.00001 |
| Pediatrician | 20.1 | 22.7 | 29.9 | 16.2 | |
| Psychiatrist | 20.0 | 19.3 | 25.4 | 16.7 | |
| Board certified | 88.1 | 90.3 | 89.4 | 90.4 | .89 |
| Academic appointment | | 56.9 | 55.0 | 48.1 | .03 |
| Major professional activity | | | | | |
| Office | 78.8 | 77.5 | 74.0 | 80.0 | |
| Hospital staff (including residents and fellows) | 12.3 | 11.4 | 16.0 | 13.2 | .09 |
| Research | 3.4 | 3.6 | 4.5 | 3.5 | |
| Other | 5.5 | 7.5 | 5.4 | 3.3 | |
| Present employment | | | | | |
| Solo/2-physician practice | 39.7 | 35.5 | 35.6 | 40.8 | |
| Group | 29.2 | 31.6 | 28.4 | 29.9 | .30 |
| Other | 31.1 | 32.9 | 36.0 | 29.4 | |
| Health maintenance organization affiliation | | 39.3 | 45.5 | 43.7 | .21 |
| Importance of attending religious services | | | | | |
| Very unimportant–important | | 83.2 | 78.7 | 76.0 | .04 |
| Very important | | 16.8 | 21.3 | 24.0 | |

[a]Respondents and nonrespondents.
[b]Chi-square test, early vs middle vs late.

**TABLE 4—Comparison of Genetics Knowledge Scores for Early, Middle, and Late Respondents**

| Score | Respondent Group, Mean ± SD: Early (n = 414) | Middle (n = 331) | Late (n = 395) | F |
|---|---|---|---|---|
| Concepts | 13.3 ± 2.6 | 13.1 ± 2.7 | 12.8 ± 2.7 | 4.30* |
| Facts | 6.1 ± 1.9 | 6.1 ± 1.8 | 6.2 ± 1.8 | 0.33 |
| Total | 19.4 ± 3.6 | 19.1 ± 3.6 | 18.9 ± 3.6 | 1.83 |

*$P = .01$.

did not differ significantly by response time. However, late respondents scored significantly lower than early respondents on the concepts subscore (Table 4). A hierarchical multiple regression with the concepts score as the dependent variable was performed to determine whether response time was independently related to the concepts score. Specialty, US vs foreign medical school attendance, academic appointments, and race, entered as predictors in block 1, accounted for 12.3% of the variance in the concepts score. Response time, entered in block 2, accounted for an additional 0.4% ($P < .05$) of the variance in the concepts score after the other variables had been entered.

### *Pilot Test vs Final Survey Respondents*

Respondents to the pilot test were more likely than were final survey respondents to state that it is important (51.5% vs 43.5%) or extremely important (47.1% vs 39.3%) to attempt to detect actual or potential genetic disorders (chi-square test, $P = .0002$). Scores designed to compare the knowledge of physicians who responded to the pilot test and the final survey were created by totaling the number of correct responses for 20 knowledge questions (12 concepts questions and 8 facts questions) appearing on both the pilot test and final questionnaires. Neither the overall knowledge score nor the two subscores differed significantly between pilot test and final survey respondents. However, obstetricians in the pilot test scored almost two points higher in overall knowledge than those in the final survey. This difference was not statistically significant because of the small number of obstetricians in the pilot test. Obstetricians in the pilot test did not differ significantly from geneticists in knowledge.

## *Discussion*

The dramatic increase in the physician response rate from the pretest to the final survey is attributable to a combination of incentives and follow-up. As has been shown previously in surveys of physicians,[4,7] the monetary incentive was an important factor. The offer of continuing medical education credits was not as effective overall but contributed to the response rate of family physicians, for whom such credits are important for recertification. Repeated follow-ups elicited a gradual increase in response. In summary, response rates can be improved in

mail surveys of physicians when incentives and persistent follow-up are used.

Certain groups of respondents were more difficult to recruit. Foreign medical school graduates were less likely to respond than were US graduates, as has been found in previous research.[1] With protracted efforts, a higher proportion of responses from foreign medical school graduates was obtained. Therefore, follow-up did improve sample representatives. Nevertheless, differences between respondents and nonrespondents in sociodemographic and professional characteristics remained. Although statistically significant, these differences were relatively small in magnitude. In surveying physicians, efforts should be directed at obtaining responses from groups that are typically difficult to recruit, such as foreign medical school graduates.

For pilot test respondents, the perceived importance of detecting genetic disorders was higher than for respondents to the final survey. In the absence of incentives, we believe that respondents to the pilot survey were more likely to be motivated by belief in the importance of genetics than were nonrespondents. This can contribute to response bias, as was probably the case for obstetricians in the pilot test whose knowledge scores were not significantly different from those of geneticists.

Changes in response rates in the final survey had minimal impact on the primary dependent variable of genetics knowledge. A small difference between early and late respondents was found for one knowledge subscore. Although the effect of increased response rates on the principal outcome variable in this survey was minimal, this may not be the case in studies of other topics. Therefore, every effort should be made to attain as high a response rate as is practical and to establish that respondents are representative of the population being sampled. □

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